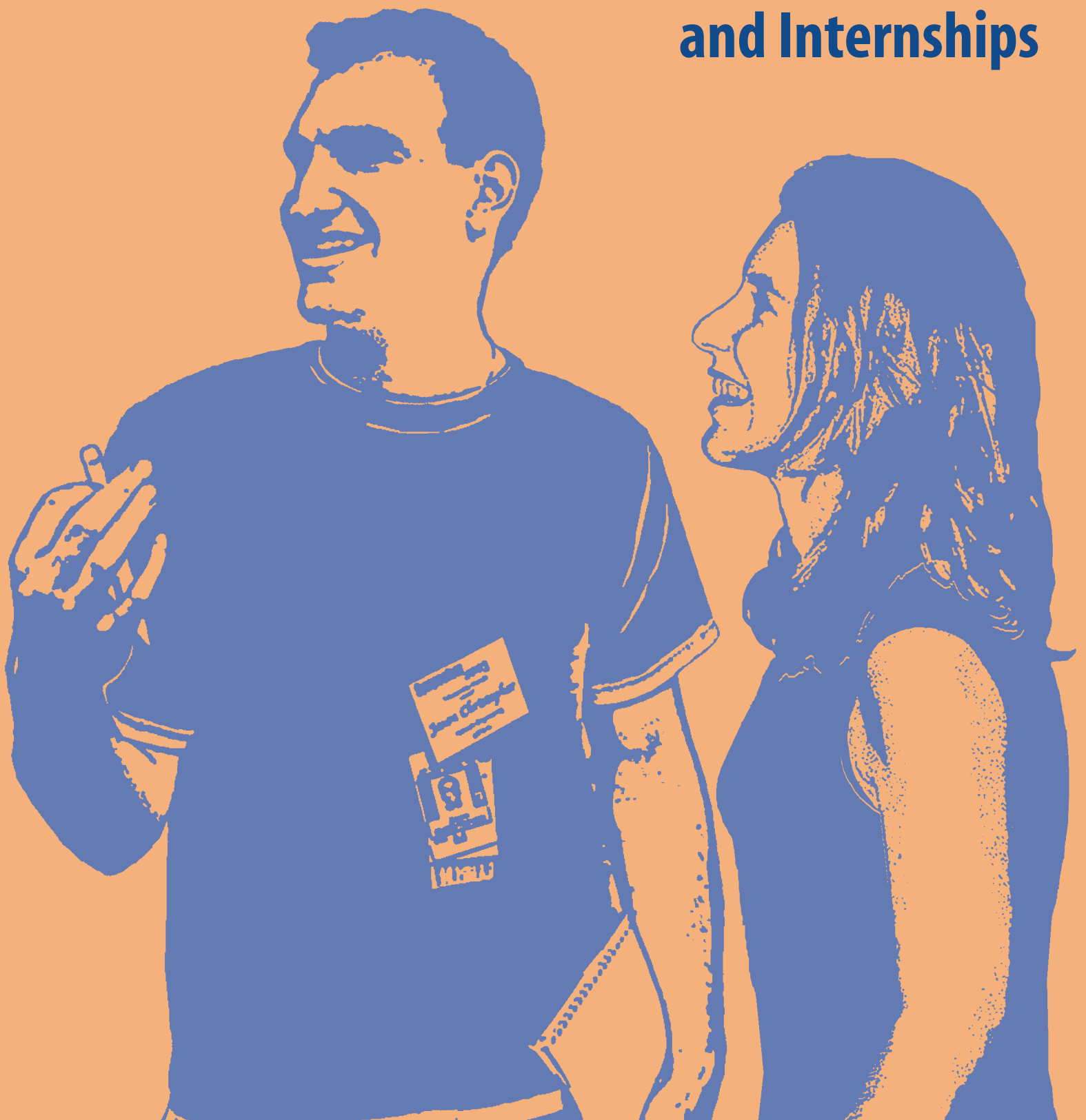


Section 2

Student Research and Internships



Introduction

The Education Program Office (EPO) in Science and Technology Base Programs (STB) at Los Alamos National Laboratory (LANL, the Laboratory) offers internships and cooperative educational experiences for high school, undergraduate, and graduate students. By offering these internship and cooperative educational experiences, the Laboratory hopes to attract and retain quality students who will identify the Laboratory as the place to launch their careers.



Some students play basketball and others watch the game during the 2003 All-Student Picnic in Urban Park.

High School Co-op Program

Program Description. The High School Cooperative Program at Los Alamos National Laboratory (the Laboratory) provides eligible high school juniors and seniors with the opportunity to develop basic employability skills and gain valuable work experience while being exposed to a variety of technical and administrative career fields.

A unique component of the high school program is that the participating high school career or guidance counselors establish the eligibility criteria for students in their schools to participate and receive credit. They screen the students for aptitudes, interests, grade point average, and number of credits toward graduation. Alternative and home-schooled students are also eligible to apply through their designated contact.

High school program participants have the opportunity for full-time work during the summer, and they may continue their appointments in part-time status during the academic year.

The Laboratory conducts scheduled campus visits and presentations each spring to increase awareness of the program and to recruit new participants for the coming year. Follow-ups with the participating schools are conducted in the fall in an effort to review programmatic changes in eligibility requirements.

The high school program is designed to complement the students' education with practical experience related to their academic interests while supporting learning that will enhance their education at the post-secondary level.

Undergraduate Program

Program Description. The Undergraduate Student (UGS) Program at Los Alamos National Laboratory represents a significant and integral part of the total recruiting strategy in meeting the Laboratory's future workforce needs for highly skilled and well educated entry-level employees.

Internships consist of summer, part-time, and full-time appointments for students who have graduated from high school and have been accepted and enrolled in an undergraduate program. Internships are year-round and provide students with relevant research experience with exceptional mentors and technologically advanced equipment, instruments, and research facilities.

Appointments are available in both technical fields and administrative fields for 90-day summer internships. Students have the option of continuing part-time work during the academic year. The maximum appointments in the program are three years for those pursuing an associate's degree and six years for those pursuing a bachelor's degree.

The post-baccalaureate category of the UGS program offers college graduates the opportunity to participate in the program a maximum of one year after graduation. The intent of this category is to provide students with the opportunity to determine their future professional and academic objectives. Students wishing to continue their studies have this time to take graduate school admission tests and to apply to their chosen institutions. When they are accepted and enrolled in a graduate program, the students shift to the Graduate Research Assistant (GRA) program at the Laboratory.

Moving to a technical or administrative

Laboratory staff position is an option available to undergraduate students whose unique skills and credentials qualify them for selection into a competitively advertised position. Students also have the invaluable opportunity to participate in the annual student symposium at which they can showcase their research or project results.

The UGS program provides participants with the opportunity to make meaningful contributions to the Laboratory's mission, to develop personal and professional career networks, and to explore the possibility of future full-time employment.

The strategic recruiting effort to help increase the diversity of the Laboratory's student and entry-level workforce has, over the years, involved collaboration with various campuses throughout the nation and with all of the two- and four-year New Mexico institutions.



Norman H. Magee of the Laboratory's Atomic and Optical Theory Group (T-4) passes out New Mexico mementos to students at the farewell luncheon for the FY03 Summer School for the Physical Sciences.

Graduate Research Assistant Program

Program Description. The Graduate Research Assistant (GRA) Program at the Laboratory is a year-round educational program that provides students from across the world with relevant research experience while they are pursuing a graduate degree program.

To be eligible for the program, an applicant must hold a bachelor's degree and be accepted and enrolled in a graduate program. Appointments are available in both technical fields and administrative fields for 90-day summer internships. Interns have the option to continue part-time work during the academic year. Students are selected on the basis of field of study, research interests, and Laboratory needs. In some cases, students may arrange to conduct their master's or doctoral thesis research at the Laboratory.

The degrees pursued by the graduate students in this program are extremely varied, ranging from quantum mechanics and astrophysics to computer science, materials science, and cancer research. Positions are also available in nontechnical areas such as finance, human resources, and industrial business development.

Once they have completed their degrees, GRAs may shift into regular Laboratory appointments, working in defense or science-and-technology programs.

Performance. The GRA program has the following major objectives:

- Provide the Laboratory with a pool of entry-level professional talent;
- Provide participants with access to the resources of a world-class, state-of-the-art research facility; and
- Provide participants with an opportunity to interact with professional staff members who are experts in fields such as physics, materials science, computer science, and engineering.

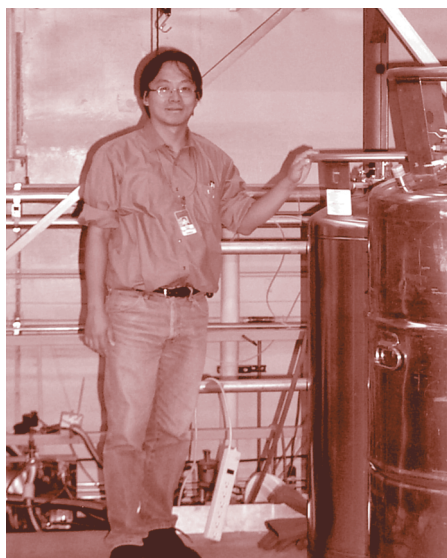


Cooperative Agreement on Research and Education

Program Description. The Cooperative Agreement on Research and Education (CARE) provides research opportunities for University of California (UC) students and faculty members to participate in new and innovative research with Los Alamos National Laboratory (LANL, the Laboratory). Through this agreement, the Laboratory seeks to enhance research collaborations with universities in areas of strategic importance and to provide a research environment that will encourage students to pursue technical careers—possibly at the Laboratory.

Cooperative agreements have been signed with the following UC campuses: Riverside, Santa Barbara, Davis, and San Diego. The agreements allow the institutions to take full advantage of their strengths and to build on areas of excellence. Proposals have been funded at the UC-Santa Barbara, Riverside, and Davis campuses.

Similar agreements are being developed with New Mexico research universities.



Li-Chun "Richard" Tung, a participant in CARE, poses where he works—at the National High Magnetic Field Laboratory.

The Laboratory and the UC campuses began by identifying initial areas of research of mutual priority interest that will be supported. The process for establishing a specific collaboration is as follows: A campus principal investigator and a Laboratory principal investigator jointly propose a research project in one of the identified strategic focus areas. A UC campus senior official (the vice chancellor, for example) and the Laboratory's UC Coordination Team leader serve as points of contact and facilitators for the program. A joint UC campus-LANL steering committee for CARE oversees the implementation of CARE and conducts periodic reviews to recommend proposals to be funded.

All work performed under this collaborative research program is unclassified. Emphasis is placed on student participation as a vital part of the research collaboration. Students are placed in rewarding work assignments that complement the university programs and Laboratory needs. In general, students perform their course work at a UC campus and perform research at the Laboratory at an appropriate time determined by the student's faculty advisor and the LANL mentor.

Faculty participation and advisement is a component of both the on-campus and off-campus portions of the program. Faculty advisors and Laboratory mentors monitor progress to assure that the students have a positive experience in the program.

Performance. The collaborations provide education and research opportunities for students and give faculty members opportunities to participate in new and innovative research.

Academic interactions help the Laboratory to attract top-notch students, to collaborate with world-class faculty members, and to retain research staff members. The CARE program provides a unique opportunity for students to understand and participate in the Laboratory's research programs. The Laboratory's goal is to provide a continuing pipeline of scientists and engineers to maintain LANL's national security and science missions. The UC campuses benefit through the use of Laboratory facilities, resources, and intellectual capabilities. Successful collaborative programs enhance the synergy and cross-fertilization of ideas, provide solutions to scientific challenges, and develop new technologies and research areas.

Highlights of this Year's Accomplishments.

The CARE program is relatively new for the UC campuses and the Laboratory. Fiscal year 2003 (FY03) was the first year that monetary awards were disbursed for research collaborations, student support, and travel. Students arrived at the beginning of January 2003 and throughout the summer. Two students worked into the fall on CARE proposals.

FY03 Student Participation in CARE

	Postdoctoral	Graduate	Undergraduate
UC-Santa Barbara	1	10	5
UC-Riverside	3	8	2

Experimental Program to Stimulate Competitive Research

Program Description. The New Mexico Experimental Program to Stimulate Competitive Research (EPSCoR) gathers resources and expertise from academic institutions, national laboratories, private industry, and state and federal sources to benefit education, the environment, and the New Mexico economy. A major goal of the program is to assure that New Mexicans gain access to superior education, state-of-the-art research, and the quality of life and employment opportunities associated with an active and competitive science and technology base.

Since being designated an EPSCoR state in 2001, New Mexico has secured more than \$34 million in federal grants for research and education—much of which represents new funding opportunities available to New Mexico only as an EPSCoR state. EPSCoR operates on the principle that aiding researchers by securing federal funding for them helps to develop the state's research infrastructure, and, therefore, promotes economic growth.

In 2002, Los Alamos National Laboratory (LANL, the Laboratory) committed funds in support of EPSCoR with the goal of building long-term research collaborations. Under the program, funding is allocated for the support of New Mexico students. The success of the program depends on recruiting excellent students, ensuring effective mentoring, achieving a good match between collaborators at LANL and at New Mexico university campuses, and conducting high-quality scientific research. EPSCoR research at the Laboratory focuses on natural resources and the environment.

Performance. The Laboratory's goal is to work with EPSCoR and to build research collaborations between LANL and New Mexico institutions of higher education. LANL and campus mentors are committed to these collaborations. Funding for this program provides the opportunity to build relationships and enables students to work on useful research projects.

Highlights of This Year's Accomplishments.

In fiscal year 2003 (FY03) the Laboratory supported three students. One came from the University of New Mexico (UNM), and two came from New Mexico State University (NMSU). The UNM collaboration involved hydrologic modeling of watershed behavior. One of the NMSU projects involved research on disturbance of habitat by human activities and whether such disturbance leads to an increase in hybridization. The second NMSU project tackled a problem in the application of the LANL laser-induced breakdown spectroscopy (LIBS) instrument, producing a significant advance in soil carbon measurement.

One other FY03 EPSCoR-related incident deserves mention—although it was not directly tied to Laboratory research. This incident demonstrated the high quality of the EPSCoR students who work and train at LANL.

Because of the Laboratory's emphasis on safety, Jason Ploss, an EPSCoR student from NMSU assigned in the Laboratory's Atmospheric, Climate, and Environmental Dynamics Group (EES-2), was required to complete training in first aid and cardiopulmonary resuscitation. During the Labor Day weekend in September 2003, Ploss and a climbing partner, Tina Sommer, an employee in EES-2,

were climbing the Ellingwood Arete on Colorado's Crestone Needle when they saw another climber fall. The injured man had compound fractures to his right leg and a fracture to one shoulder. The incident occurred in a remote area, and emergency services were not immediately available.

Using knowledge drawn from his Laboratory training, Ploss acted immediately to stabilize the injured climber and continued to care for him until emergency-service providers arrived several hours later.

Ecology Team Leader Michael H. Ebinger of EES-2 nominated Ploss for a Los Alamos (National Laboratory) Awards Program monetary reward, but Ploss did not get it because he was not a regular University of California employee. Climbers in EES-2, however, donated \$300 to give Ploss an award, and he and Sommer were honored at an EES-2 Group Meeting.



Jason Ploss, an NMSU student in the EPSCoR program—shown here at work in EES-2—used knowledge drawn from training he had received at the Laboratory to stabilize and care for a fallen climber in Colorado. Fellow climbers in EES-2 raised \$300 as a reward to honor him for his life-saving action.

Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM Fellowship Program)

Program Description. Every year, a significant number of students from underrepresented minorities enter undergraduate engineering and science programs. However, people from underrepresented minorities represent less than 5% of the recipients of advanced degrees in engineering or science.

The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM), a nonprofit organization, was formed in 1976 to address this problem. Specifically, GEM exists to increase the number of American Indian, African American, and Latino, Puerto Rican, and “Other Hispanic” Americans pursuing graduate degrees in engineering, physical science, and natural science disciplines. GEM Fellows obtain practical work experience through summer internships at GEM employer worksites.

GEM is a tax-exempt, nonprofit corporation with headquarters at the University of Notre Dame in Indiana. GEM is jointly sponsored by a consortium of university and company members and is governed by a board of directors composed of GEM representatives from the members. The board is responsible for policy and serves as the legal representative for the GEM Consortium.

GEM is a center of excellence engaging in activities that reach beyond recruitment and retention, leading students to graduation from master’s degree and doctor’s degree programs in engineering and science. Through GEM, comprehensive nationwide programs have been established to identify, recruit, and enroll minority science and engineering students in graduate programs leading to advanced degrees. GEM offers master-of-science engineering, doctoral engineering, and doctoral science fellowships. In addition, GEM produces publications and videos for graduate, undergraduate, and precollege students. GEM also provides courses to prepare undergraduates to succeed in graduate classes and guidance for graduate-level students on how to achieve success in doctoral research programs.

GEM’s program activities go beyond financial support by engendering student success in academic and professional environments. GEM has a solid success record in implementing effective programs to increase the recruitment, retention, and graduation of minority students.

As a corporate member of the GEM Consortium, Los Alamos National Laboratory (LANL, the Laboratory) provides funding for sponsored GEM fellows to pursue master’s and doctor’s degrees in engineering and science. In addition, the Laboratory provides funding for the fellows to spend two consecutive summers conducting research at LANL.

The scientific employment pipeline at the Laboratory benefits greatly from the LANL partnership with the GEM Consortium and from the consortium’s success. The Laboratory has sponsored 46 GEM fellowships since becoming a corporate member in 1979.

To learn more about GEM, visit <http://www.nd.edu/~gem/>.

Performance. GEM’s mission is to enhance the value of the nation’s human capital by increasing the participation of underrepresented minority group members at the master’s and doctoral levels in engineering and science. GEM accomplishes this goal by identifying and attracting high-quality students to graduate school in engineering and sciences and by providing the most cost-effective process for matching students with the needs of member universities and company sponsors.

The intent of the Laboratory’s corporate membership in the GEM Consortium is to establish a sustained and continuing pipeline of minority-group graduate students in science and engineering feeding into the Laboratory’s research population and pursuits. Membership in GEM is an indication of the Laboratory’s commitment to human and research diversity.

The Laboratory's recruitment strategy for the program involves, primarily, educating students in the existing summer internship programs on the merits and benefits of a GEM fellowship. Additional recruitment is carried out by Laboratory representatives while they are conducting campus visits and going to career fairs to encourage students to consider summer and/or academic-year research opportunities and, eventually, career options at the Laboratory.

Finally, the Laboratory's GEM alumni are instrumental in marketing the program to potential future fellows. Currently, two alumni serve on the Laboratory's GEM Selection Committee, established in fiscal year 2000 to ensure suitable and talented selection of the Laboratory's GEM fellowship recipients.

Highlights of This Year's Accomplishments.

This year, LANL awarded three GEM fellowships. Following are brief profiles of the 2003 LANL GEM Fellows, drawn from individual interviews done in the summer of FY03.

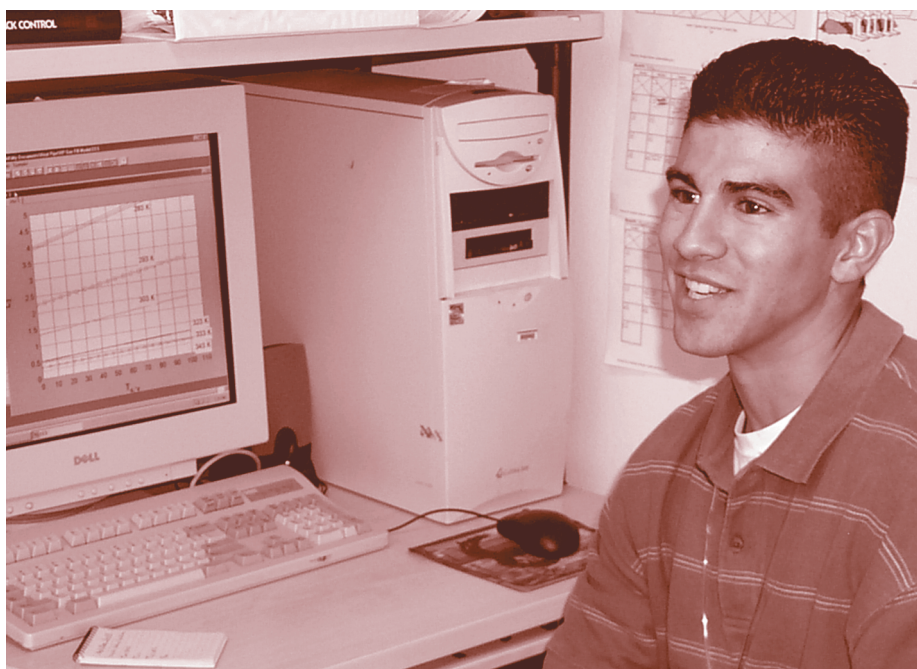
Jedediah Alderete had earned a bachelor's degree in mechanical engineering (ME) at New Mexico State University (NMSU) in May 2003 and was working toward his master's degree in ME at the same university. He spent summer 2003 doing cryogenic engineering in the Engineering Sciences and Applications Division's Applied Engineering Technologies Group (ESA-AET).

Asked about his research, Alderete said, "I'm trying to get a heat pipe running." (A heat pipe is a device used for the efficient transfer of heat.) It was an old project, Alderete said, but it was changing and growing. "We're trying to make something called a 'heat pipe calorimeter,'" Alderete said. The device would be able to sense very small changes in heat. It could be used to identify substances. "These devices are available," he said, but only on a

major scale. He wanted to create one that was smaller, simpler, and more portable—one that would fit into a suitcase. To create such an instrument, he needed to find ways to reduce the space demands of the calorimeter controls.

"I hadn't had too much work in thermal sciences" before coming to Los Alamos, he said, but in the summer of 2003, he got an opportunity to apply what he had learned at NMSU and delve into the field more thoroughly. He hoped to return to the Laboratory in the summer of FY04.

Asked if he would recommend GEM to others, he said, "Of course." It can be the key, he said, to a "list of possible employers," many of which offer very good jobs. He sees Los Alamos as one of the best.



Jedediah Alderete, a GEM fellow, spent the summer of 2003 doing cryogenic engineering. His goal was to make a heat pipe calorimeter that would fit into a suitcase.

Rafael Padilla, a recent graduate of NMSU who holds a degree in ME, did thermal engineering work in ESA-AET during the summer of FY03. In the fall of FY03, he planned to move to Stanford University and begin working toward a graduate degree in ME—probably with a specialty in heat transfer. He said he probably would be at the Laboratory again in the summer of FY04, although he knew he would also be juggling Stanford work requirements.

Asked about his work in ESA-AET, Padilla said, “My main project was setting up instrumentation that will measure very small velocity and temperature fluctuations.”

Asked if he would recommend the GEM program, he said, “Yes, I would. It’s really challenging.”

Eventually, Padilla said, he might like to return to the Laboratory as a staff member. “I enjoy working here,” he said.



Rafael Padilla, who already held a degree in mechanical engineering from New Mexico State University, did thermal engineering work as a 2003 GEM fellow. He said, “My main project was setting up instrumentation that will measure very small velocity and temperature fluctuations.” He planned to begin his graduate work at Stanford University in the fall of FY03.

Joseph Sanchez earned a bachelor's degree in electrical engineering at the University of New Mexico (UNM) in 2002. He started graduate school at UNM in fall 2003, seeking a master's degree in electrical engineering. His summer 2003 research was done with the Instrumentation and Controls Team (I&C) for Design Engineering Construction Services (DECS).

Although he was still a student, he already had considerable experience at the Laboratory. He graduated from Española, New Mexico, Valley High School in 1996, and immediately went to work in the Laboratory's Business Operations 7 (System Support) doing computer maintenance. Eventually, he started working with DECS, which is part of the Facility and Waste Operations Division. He worked in DECS for three summers as an undergraduate student.

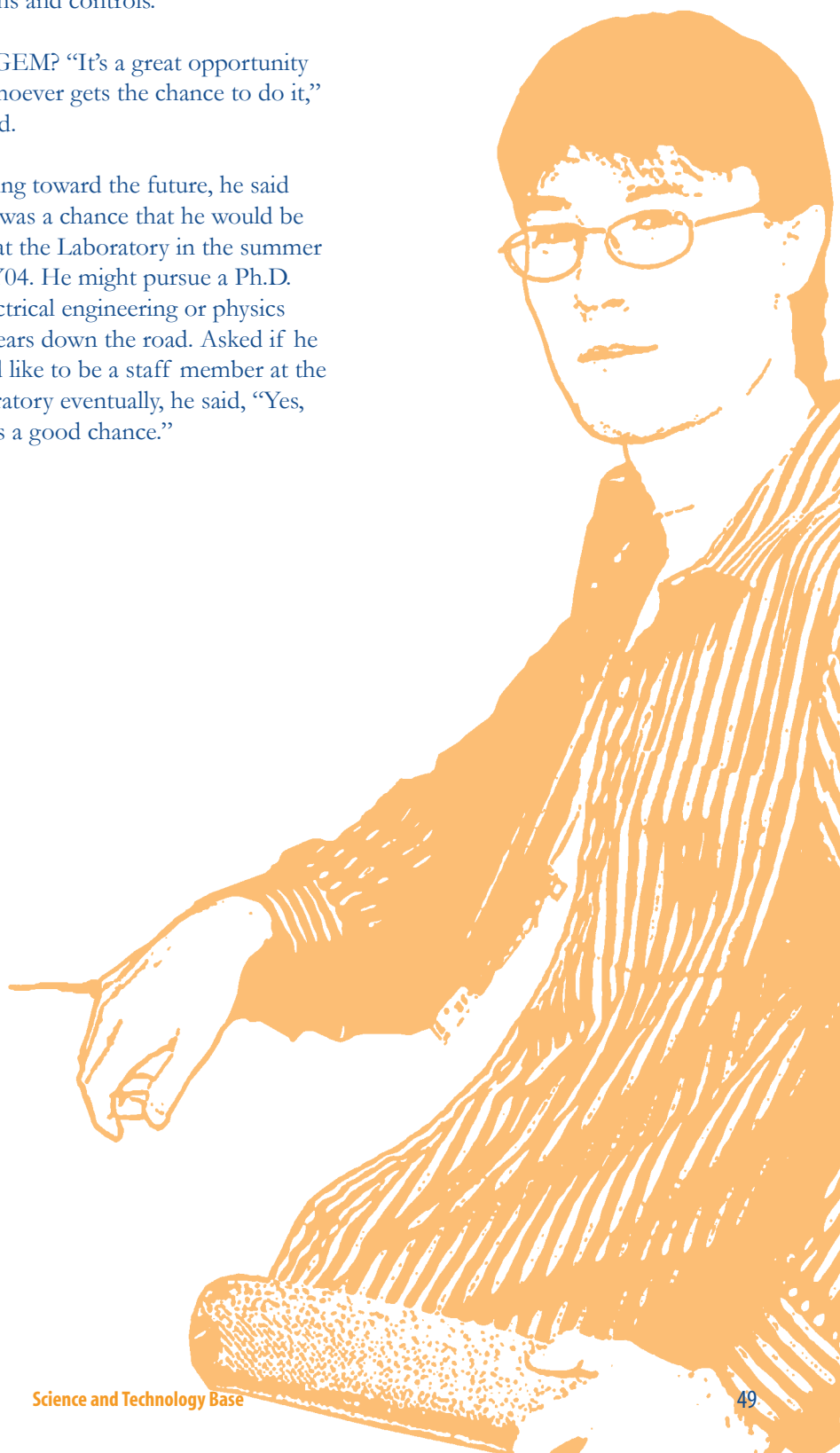


Joseph Sanchez, who earned a bachelor's degree in electrical engineering at the University of New Mexico, was a GEM fellow at the Laboratory in FY03. He said his work involved "doing commissioning on control systems"—verifying that they operated properly. Such work is vital, he said, because it saves the Laboratory money. It also made use of his education at UNM.

Asked about his work in the summer of FY03, Sanchez said, "We're doing commissioning on control systems—where you verify that they operate properly." Such work is vital, he said, because it saves the Laboratory money in the long run. Asked whether his work made use of his studies at UNM, he said, "Yes. My concentration is in systems and controls."

And GEM? "It's a great opportunity for whoever gets the chance to do it," he said.

Looking toward the future, he said there was a chance that he would be back at the Laboratory in the summer of FY04. He might pursue a Ph.D. in electrical engineering or physics five years down the road. Asked if he would like to be a staff member at the Laboratory eventually, he said, "Yes, there's a good chance."



Hertz Foundation Scholars Program

*Fannie and John Hertz Foundation
Devoted to Applications of the Physical Sciences*

Program Description. The Hertz Foundation Scholars Program, a graduate program in its third formal year of collaboration with Los Alamos National Laboratory (LANL, the Laboratory), provides summer graduate research associate positions. The students chosen are working toward a doctoral degree in applications of the physical sciences ranging from electrical engineering to molecular biomedicine. The Laboratory recognizes that these young people possess some of America's most promising technical talent and have received recognition from one of the most prestigious foundations in the nation.

Each spring, Hertz Scholars are recruited for summer positions at the Laboratory. Those considered for selection come from the list of finalists who are competing for the Hertz Foundation Graduate Fellowship Award. To be eligible, the students must be majoring in applied sciences (aeronautics, biology, computer science, materials science, etc.). The Hertz Foundation only accepts applications from students who will be attending one of 36 prominent graduate schools. Only 20 students actually receive the fellowship award, which consists of a cost-of-education allowance and a personal-support stipend.

At LANL, the Hertz students work beside some of the Laboratory's best mentors. The contribution that these students bring to the Laboratory in such a short time is remarkable, making this collaboration highly successful. Because it is extremely important to the future of the Laboratory to attract the next generation of quality scientists and engineers, this partnership has great value.

To enhance the FY03 program, the Laboratory contacted the 2001 and 2002 finalists and asked them to submit their resumes for the Distinguished Students Program. Each of the finalists was provided with a

list of possible Laboratory-Directed Research and Development projects as an enticement to recruit them to the Laboratory.



When the Hertz Fellowship Awards were announced in April 2003, the Laboratory received copies of the applications of the finalists and the fellows. The Laboratory contacted each of these students to determine whether he/she would be interested in a summer research position. Those who were attracted by the challenging research that the Laboratory offers responded to the invitation. At this point, the Laboratory began a search for the best mentor and research experience for each student. Some of these talented students actually had several research offers and were allowed to choose the option that best fit their studies.

Performance. The principal goal of the Hertz Foundation Scholars Program is to encourage some of the nation's most talented graduate students to share their expertise with the Laboratory, which, in turn, provides them with a challenging and unique research opportunity. While at the Laboratory, they have access to facilities and state-of-the-art equipment not ordinarily available on a university campus. They also have contact with many of the world's most illustrious scientists.

During the summer research sessions, the students strive to achieve the following objectives:

- Increase their knowledge and skills in their fields of study;
- Increase their understanding of the research process;
- Increase their understanding of national laboratories and the important research accomplished at these facilities;
- Strengthen and focus their fields of study and career plans; and
- Tour various facilities at the Laboratory and meet personally with the Director.

This program focuses on long-held Laboratory desires for diverse, entry level, and strategic hiring. Diverse and entry-level students make up this program. The Laboratory is tracking these young professionals to ensure that they will find its programs viable and challenging options when they are ready for postdoctoral appointments or permanent employment.

Highlights of This Year's Accomplishments.

The six 2003 Hertz Foundation scholars arrived at the Laboratory at various times from May through September. Most were able to experience at least 90 days of research at the Laboratory. On August 19, 2003, the Hertz students were honored at an informal luncheon hosted by the Laboratory Director.

Following are a few representative comments from LANL mentors who worked with Hertz students:

This Hertz Scholar's "work was simply outstanding and far surpassed my expectations. He would be an excellent candidate for future employment at LANL, and he expressed a sincere interest in working at LANL following completion of his Ph.D. studies. We will include his work in future publications."

This Hertz Scholar "from John Hopkins University worked on condensed matter physics at the Lujan Neutron Scattering Center during the summer of 2003. He had two experiments on Pharos, an inelastic neutron scattering spectrometer, both worked out by his thesis advisor, Collin Broholm, in collaboration with LANSCE (Los Alamos Neutron Science Center) staff. If a paper results from those experiments, it will be written in the coming year as more data will be needed. The Hertz Scholar Program at LANL is invaluable to the Lab for outreach. Our Scholar helped to re-establish a strong connect to a faculty member who had been quite actively collaborating with the Lab until a few years ago. With the return of our Scholar next summer, we would count this collaboration as one of our key strategic institutional alliances."

This Hertz Scholar "worked on pattern formation and nonlinear dynamics of oscillatory systems. We will be writing a research paper on the topic, and she will most likely be coming back to visit next summer. She was the best student at her level (just starting graduate school) that I have ever had. I expect her to be the best in her applied mathematics graduate class at Princeton. LANL should make every effort to identify and hire students of her caliber."

Schools Attended by FY03 Hertz Foundation Scholars

Undergraduate/Graduate School	Number of Students
The University of Texas	1
North Carolina State University	1
Massachusetts Institute of Technology	2
University of St. Thomas	1
The Johns Hopkins University	1

McDermott Scholars Program

Program Description. The Eugene McDermott Scholars Program at Los Alamos National Laboratory (LANL, the Laboratory) provides the Laboratory with summer undergraduate research associates who are working toward a bachelor's degree in subjects ranging from electrical engineering to biology. The second summer of the McDermott program at the Laboratory was conducted in fiscal year 2003 (FY03).

The Laboratory recognizes the young men and women in the McDermott program as among America's most promising and talented students. They come from a school that is one of the fastest growing public universities in the United States (U.S.)—the University of Texas at Dallas (UTD). The school of engineering and computer science at UTD is the fastest growing engineering school in the U.S. and ranks second nationally in the number of computer science graduates.

McDermott Scholars are recruited to UTD from a list of national and international finalists. They are selected on the basis of their promise of being leaders for Dallas, the U.S., and the world community during the 21st century. Their promise is demonstrated by records of high intellectual achievement and evidence of leadership skills, high ethics, and a commitment to full participation in the program—with all its privileges and responsibilities.

The nine students who interned at the Laboratory in FY03 were members of the entering 2002 class of McDermott scholars, which included five National Merit Scholars, nine high school valedictorians, and one salutatorian. The average SAT score of the class was 1470.

The contribution that these students brought to the Laboratory in such a short time is remarkable. Because it is extremely important to the future of the Laboratory to attract the next generation of quality scientists and engineers, this partnership has promising prospects.

By all accounts, the Laboratory's collaboration with UTD and the exceptional McDermott Scholars Program has been a great success. The Laboratory will continue to collaborate with this program to attract these scholars to Los Alamos.

Performance. Leadership for the 21st century is the principal goal of the Eugene McDermott Scholars Program at UTD. The Laboratory recruits these students and provides them with a challenging and unique research opportunity by giving them contact with many of the world's most illustrious scientists and access to facilities and state-of-the-art equipment not ordinarily available on a university campus.

During the summer research sessions the students strive to achieve the

following objectives:

- Increase their knowledge and skills in their fields of study;
- Increase their understanding of the research process;
- Increase their understanding of national laboratories and the important research being accomplished at these facilities; and
- Strengthen and focus their fields of study and career plans.

Strategically, this program targets the Laboratory's Institutional Goal No. 7: "Focus on diverse, entry-level, and strategic hiring." Diverse and entry-level students make up this program. The Laboratory is attempting to track these young professionals to ensure that the Laboratory will be a viable and challenging option when they are ready for postdoctoral appointments or permanent employment.

Highlights of This Year's Accomplishments.

The nine McDermott Scholars arrived in May, and most were able to experience at least 10 weeks of research at the Laboratory. The group included two female Asians, one male Asian, two female Caucasians, and four male Caucasians.

On August 7, 2003, the McDermott Scholars from the class of 2003 (possible interns for the summer of 2004) visited the Laboratory for a day of activities. The day began at

the Bradbury Science Museum with welcoming remarks by William H. Press, Laboratory deputy director for science and technology. The scholars next took a tour and watched a demonstration of the Acoustic Resonance Spectroscopy equipment that recently won an R&D 100 Award. The students then proceeded to the Visualization Laboratory at the Reconfigurable Advanced Visualization Environment (RAVE) for a tour and demonstration. Afterward, the scholars split into two groups to tour the Laboratory. The day ended with talks about student programs at LANL and discussions with mentors in the students' fields of study.



FY03 students in the Eugene McDermott Scholars Program enjoy an in-the-round experience in the Visualization Laboratory at the Reconfigurable Advanced Visualization Environment (RAVE).



National Physical Science Consortium

Graduate Fellowships in the Physical Sciences

Program Description. The National Physical Science Consortium (NPSC) is a unique partnership between industry and higher education. Established in 1987, the NPSC is headquartered in Los Angeles.

The NPSC has one primary objective: to increase the number of doctorates earned in the physical sciences and related engineering fields by qualified United States (U.S.) citizens—especially by women and people from historically underrepresented minorities. The program achieves its objective by awarding doctoral fellowships to outstanding students and by facilitating the creation of research and employment opportunities.

Strengthening diversity among U.S. scientists and engineers is more than a worthy goal; it is an imperative. The U.S. has long led the world in advancing the physical sciences, but if it is to continue competing on a global scale, it must be able to train and recruit a diverse pool of qualified scientists.

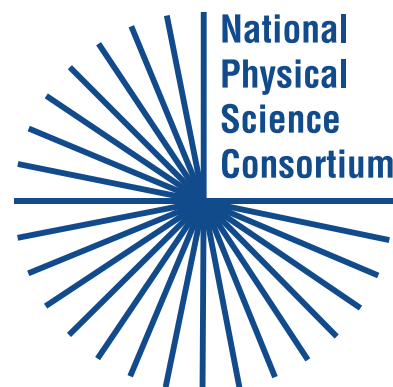
While the population of people from historically underrepresented minorities in the U.S. has grown significantly, the number of U.S.-born physical scientists, both in industry and in academia, has fallen:

- Of the physical sciences doctorates granted in 1998, only 54% went to U.S. citizens.
- Of nearly 6,000 engineering degrees granted in 1998, only 43% went to U.S. citizens.
- Of all U.S. citizens granted Ph.D.s in the sciences and related engineering fields in 1998, women accounted for only 37%; and African Americans, Hispanics, and Native Americans accounted for only 17%.

Foreseeing this trend nearly two decades ago, a national task force recommended creating the NPSC. Initially funded by the National Science Foundation, Lawrence Livermore National Laboratory, and the U.S. Department of Energy (DOE), the NPSC is now self-sustaining because of a modest endowment and annual membership fees from employer members—one of which is Los Alamos National Laboratory (LANL, the Laboratory). Since granting its first fellowship award to seven young scholars in 1989, the NPSC partnership has provided fellowships to nearly 300 aspiring scientists and engineers. Of these, nearly half are members of minority groups, and 75% are women. Since 1989, the NPSC has sponsored 217 women—72% of the people selected for the program.

Because the NPSC is helping to provide a continuous source of U.S.-born scientists, employers and universities can achieve greater diversity and balance in the nation's scientific community. In addition, the NPSC is helping today's promising young scientists—tomorrow's science leaders—realize their dreams.

Performance. By working with the National Physical Science Consortium, the Laboratory hopes to increase the existing pool of Ph.D.s in the physical sciences, placing special emphasis on diversity while supporting the DOE and Laboratory missions. To help achieve these important missions, the NPSC focuses student research assignments on the Laboratory's critical-skills areas.



Highlights of this Year's Accomplishments.

The Laboratory sponsored four students through the NPSC during FY2003 (FY03). All of these students represented continuing sponsorships. The profiles of two NPSC participants below—both drawn from interviews done during the summer of FY03 illustrate the value of the program.

For graduate student **Chris Beltran**, his FY03 assignment in the Los Alamos Neutron Science Center (LANSCE) in Los Alamos was perfect. It provided him with a way to do useful scientific work and prepare a highly technical doctoral thesis in physics at the same time, pursuing studies that would not have been possible anywhere else in the world.

He enjoyed working with the scientists at the site. He commented, “We have meetings all the time,” and, “in general, the people around here have been very helpful if I have questions....”

He began writing his thesis while he was at LANSCE, and he got a jump start on his career. He was the lead author on an article entitled “Calculations and Observations of the Longitudinal Instability Caused by the Ferrite Inductors at the Los Alamos Proton Storage Ring (PSR).” And in May 2003, he presented this paper and described his work at the Particle Accelerator Conference in Portland, Oregon.

Beltran, originally from Las Vegas, New Mexico, had earned his first degree, a bachelor of science in physics and mathematics, from New Mexico State University, and it was at NMSU that he first heard in detail

about the work done in Los Alamos. (A number of NMSU professors have collaborations at the Laboratory.)

Beltran went on to Indiana University, seeking a Ph.D. in physics. He soon found that his thesis advisor, S.Y. Lee, was intrigued by the PSR and its “interesting properties.” Lee spoke with scientists at PSR, and these contacts led to Beltran’s NPSC fellowship.

Asked if he enjoyed his work and study, Beltran said yes. He commented, “I like the fact that my work has both experimental and modeling aspects. I also do a little bit of theory work.”



Graduate student Chris Beltran, an FY03 NPSC fellow, holds up a ferrite inductive insert as he discusses his research involving the Proton Storage Ring at the Los Alamos Neutron Science Center.

FY03 Participant Demographics for the NPSC Program

College/University	Area of Research at LANL	Gender/Ethnicity
Indiana University	Protons	Male/Hispanic
The University of California-San Diego	Neuroscience	Female/Caucasian
The University of New Mexico	High-temperature superconductivity	Female/Hispanic
The University of Washington	Geophysics	Female/Caucasian

Kate Denning earned a bachelor's degree in physics from Fort Hays State University (FHSU) in Kansas in 2002—but when she completes her Ph.D. at the University of California-San Diego (UCSD), her degree will be in computational neurobiology. Two summers at the Laboratory redirected her interests.

Denning first learned about the Laboratory from her advisor, Gavin Buffington, at FHSU. As a Los Alamos Summer School (LASS) student at the Laboratory in 2001, she knew nothing about neuroscience. Then she met Garrett Kenyon of the Biological and Quantum Physics Group when he gave a lecture on his work. She went to talk to him later in the summer. “Neuroscience really caught my interest,” she said.

When she returned to the Laboratory in the spring of 2002, as an NPSC fellow, Kenyon was her mentor. She came back to work with him again in the summer of 2003.

She hoped to start her thesis work at UCSD in the fall of 2003, and she said it would probably involve the lateral geniculate nucleus (LGN) and information theory. She explained that the LGN is “involved in vision,” adding that it is “the next stage of processing after the retina.”

As the summer of 2003 came to an end, she had “just finished a project on information theory” at the Laboratory. She was studying “whether cells in your retina work better together or independently.” She used information theory as a method to approach the subject. “We’re going to start writing a manuscript and submit it to a neuroscience journal,” she said.

Looking back over her experiences at the Laboratory, Denning, who earned her bachelor's degree at age 17, said, “There’s a lot about the Lab that’s unique.” She liked the fact that it is located in a small town—a situation that she found “unusual for a research institution.”

Asked if she would recommend the LANL student programs to others, she said yes. Her work with Kenyon proved to be excellent in preparing her for graduate school, she said. It led to what she is doing at UCSD today.



Kate Denning, now a doctoral candidate in computational neurobiology at the University of California-San Diego, was an NPSC fellow in FY03, but she first came to the Laboratory as a Los Alamos Summer School student in 2001. At first, she knew nothing about neuroscience, but she met Garrett Kenyon of the Biological and Quantum Physics Group when he gave a lecture on his work, and his fascinating presentation changed everything. “Neuroscience really caught my interest,” she said.

Oak Ridge Institute of Science and Education

Educational and Research Experiences

Program Description. “Are there enough well-trained professionals to meet this country’s science and technology needs?”

The Oak Ridge Institute of Science and Education (ORISE) has been addressing this issue since 1946.

ORISE administers research participation, fellowship, scholarship, and internship programs for the United States (U.S.) Department of Energy (DOE) and other federal agencies. By identifying future manpower needs in key scientific and technical areas and connecting talented students with scientific leaders, ORISE is helping to prepare tomorrow’s scientific workforce.

The Oak Ridge Associated Universities (ORAU), a consortium of 85 doctorate-granting colleges and universities, manages ORISE. The consortium includes significant representation of minority-serving institutions. ORAU operates ORISE to provide operational capabilities and to conduct research, education, and training for the DOE in the areas of science and technology, national security, environmental safety and health, and environmental management.

ORISE programs target faculty members, postgraduates, graduates, and undergraduates involved in science, mathematics, or engineering. ORISE provides a variety of educational opportunities, all of which offer 10- to 12-week summer practicums at participating DOE sites. Participants receive guest appointments at the host facility, but they are not considered contractors or employees of the facility, of ORISE, of the ORAU, or of the DOE.

Through its partnership with the Oak Ridge Institute of Science and Education (which began in fiscal year 1983 [FY83]), Los Alamos National Laboratory (the Laboratory) strengthens its ties with the academic community while focusing on developing a highly trained, diverse workforce to help meet U.S. science and technology needs.

(For more information on ORISE, visit <http://www.ornl.gov/orise.htm>.)

Performance. Utilizing state-of-the-art research facilities, the Laboratory, in partnership with ORISE, recruits and places students and faculty members in summer research projects that support the DOE and Laboratory missions. The primary goal of the program is to stimulate and encourage highly talented students to pursue careers in research at the Laboratory.

In FY03, two graduate students continued their research from the previous year using funding from the Office of Biological and Environmental Research (OBER) Minority Institutions Student Research Participation Program. OBER offers opportunities for students to participate in research relating to health and the environment—programs that directly address the Laboratory mission to solve national problems in energy, environment, infrastructure, and health security.

Highlights of This Year’s Accomplishments.

Because ORISE received extra OBER funding in FY03, both graduate students were funded beyond the normal 10-week summer appointment and allowed the opportunity to do research at the Laboratory for six consecutive months. These students and their work are described in the following paragraphs:



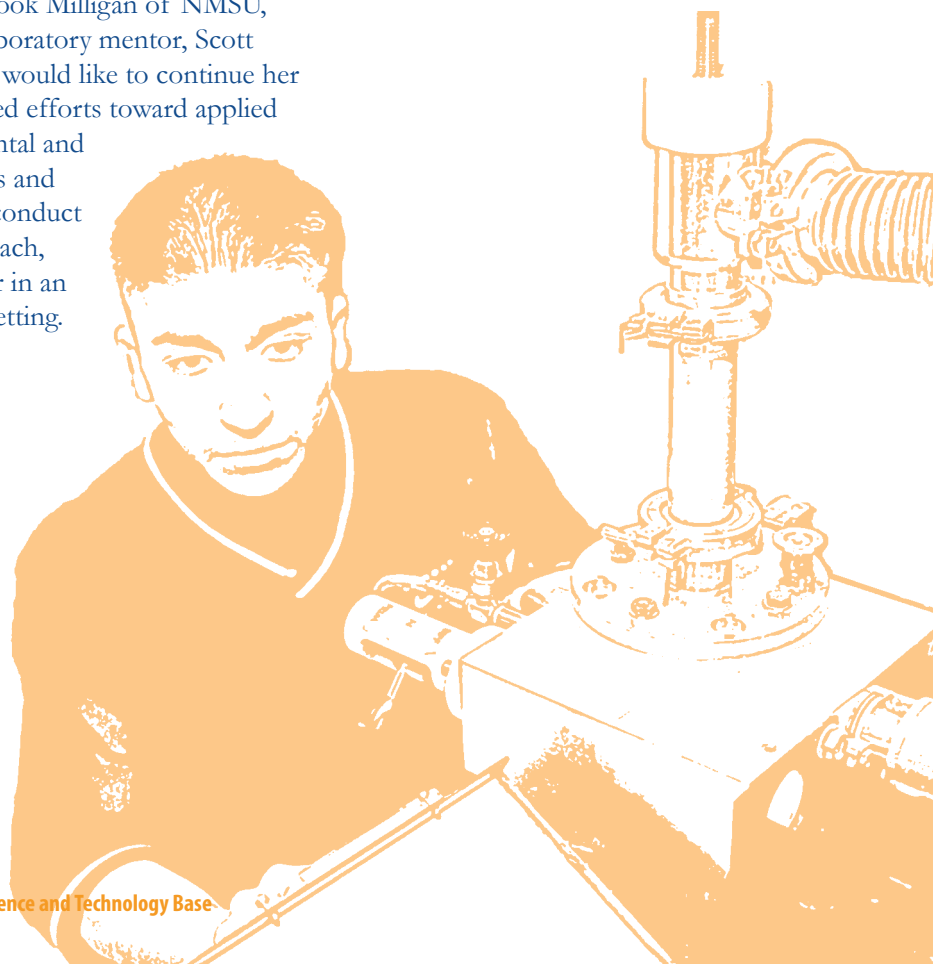
Heather Alexander is a candidate for a master's degree in "biology: with an emphasis in ecology and evolution" at New Mexico State University (NMSU). She has a 3.9 grade point average (on a 4.0 scale). She first came to the Laboratory in the summer of 1998 as an undergraduate student. Since that time, she has worked on projects using DNA analysis, has experienced significant field and laboratory work, has supervised students, is currently putting together several publications, and has been named an "Outstanding Laboratory Student" (twice). She plans to obtain a doctorate in molecular biology/genetics and would like to pursue permanent employment at the Laboratory. Her research topic at the Laboratory was "The Effects of Forest Fires on Black Bear (*Ursus americanus*) Spatial Characteristics and Genetic Diversity Using Non-Invasive Genetic Analysis." She performed collaborative research with Jon Longmire of the Bioscience Division and several staff members in the Risk Reduction and Environmental Stewardship Division's Ecology Group.

Kelly Gallagher holds a master's degree in biology from California State University at Fresno and is a doctoral candidate at NMSU. Her current research involves utilizing field-based techniques, state-of-the-art molecular-genetic data, biological computation, and statistical inference to understand evolutionary and environmental processes occurring in natural populations. Her project will



Heather Alexander of Albuquerque, New Mexico—shown here working in a biological laboratory—is a student participant in ORISE. She is working on a study of the effects of forest fires on the bear population in the Los Alamos area.

be one of the first studies of its kind to use measurements of quantitative genetics in field environments. She is working under the direction of her advisor, Brook Milligan of NMSU, and her Laboratory mentor, Scott White. She would like to continue her concentrated efforts toward applied environmental and life sciences and ultimately conduct research, teach, and mentor in an academic setting.



Research Internships in Science and Engineering

Program Description. The Research Internships in Science and Engineering (RISE) Program was new to Los Alamos National Laboratory (LANL, the Laboratory) in fiscal year 2003 (FY03).

RISE is funded by the National Science Foundation (NSF) and administered by the College of Engineering at the University of California-Santa Barbara (UCSB). In addition to College of Engineering sponsorship, RISE has sponsorship by the Materials Research Laboratory (MRL) at LANL and the Advanced Optical Materials Integrative Graduate Education and Research Traineeship (IGERT) Program at UCSB.

The program recruits competitively selected junior or senior undergraduate science and engineering majors who are interested in pursuing a research experience. It offers undergraduate students from throughout the country the opportunity to participate in a 10-week summer research experience at either the UCSB campus or at the Laboratory, where they gain first-hand experience in scientific investigation in a dynamic, collaborative research environment. The quality of the applicants to the program is very high. The UCSB Materials Science program is rated No. 1 in the nation by Sci-Watch, and its engineering program is rated No. 2. The people who run the program at UCSB have considerable experience in matching the right students with the right projects to ensure success and continued NSF support.

As a participant in the program, the Laboratory sends a list of available project descriptions and mentors to UCSB in mid-February. RISE organizers do the initial matching of potential students to projects, but they stress the need for mentors to be involved in selecting their students as well.

All Laboratory RISE interns are matched individually with mentors who provide guidance, training, and support. In addition to research, the interns also have the opportunity to develop their oral presentation skills, attend special seminars, and present their results at the annual student symposium.

Performance. The Laboratory views the RISE program as a unique program through which to help increase the number of high-quality undergraduate interns it hosts in strategic areas of science and technology. The program also strengthens Laboratory ties with the University of California.

Highlights of This Year's Accomplishments. Summer 2003 marked the first RISE Laboratory internship program, and UCSB undergraduates were selected for 10-week summer internships in Los Alamos. UCSB RISE personnel recruited RISE Laboratory interns, but the Laboratory paid all expenses (student stipend and travel, lab costs). Prospective interns were recruited through campus flyers, notices on the MRL website, and presentations at undergraduate research opportunities workshops at UCSB. By the February 28, 2003, deadline, seven students had applied. Five were offered internships at the Laboratory, and four accepted (two in computer science, one in chemistry, and one in physics).

All of the students had a good experience, and the mentors were enthusiastic about having the RISE interns at the Laboratory. One of the interns will continue his summer research off-site during his senior year at UCSB and will participate in the school-year RISE program. Another intern will graduate in December and hopes to return to the Laboratory as an employee. Mentors of the remaining two interns have asked the students to continue, either next summer or during the school year.

Comments from RISE Interns. Following are a few comments that RISE students provided in interviews discussing the program:

When asked if he would recommend the Laboratory to other students, one intern said, "Absolutely." The reasons he mentioned were "the work environment, the science, the interest of the people you're working with who are teaching you."

"We're trying to make the simplest possible life form," an intern said in an interview near the end of the summer. He added that he was "doing mostly simulations of metabolic reactions and replication dynamics." His work involved, primarily, basic chemistry and biology, he said, but he felt that it was "really interesting." What he worked on was theoretical, he said, but, "If we can really get it to work, it will be quite incredible."

One intern found Los Alamos "a little bit dull" compared to California cities. He said he discovered, however, that there are "lots of great places to go hiking. It's a beautiful area," he said. He explored the Jemez Mountains nearby, and, he said, "Santa Fe is pretty nice."

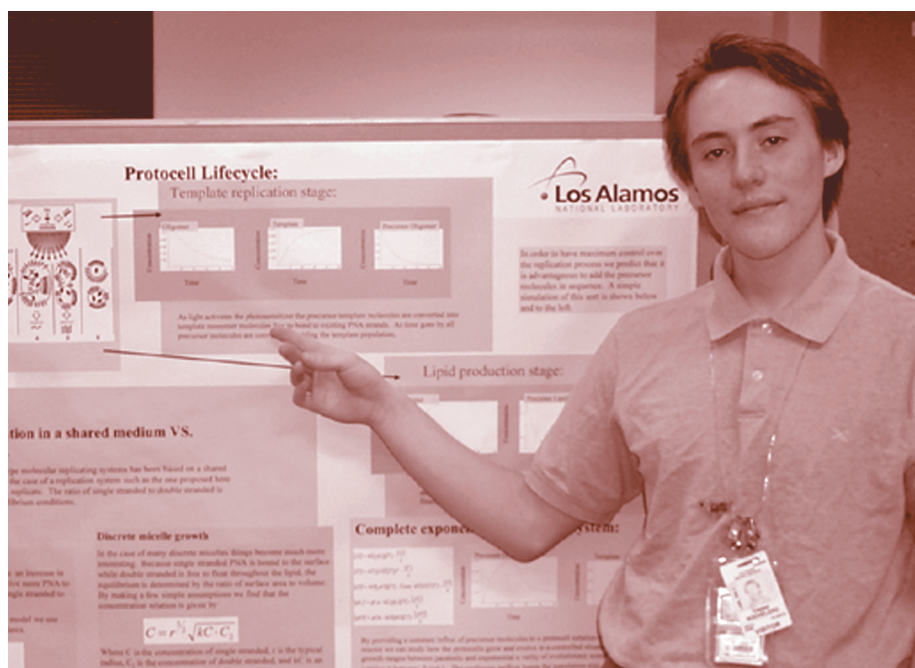
Lessons Learned in FY03. The RISE program encountered some glitches—as most new programs do. The main problem involved processing the students into the Laboratory as “student guests.” The paperwork was prepared in a timely manner but slowed as it made its way through the system. The students were brought in as guests because they were being paid a stipend predetermined by NSF and UCSB. They were unable to come through the Laboratory’s Undergraduate Program because it would have paid them at a higher salary than the stipend provided, and UCSB did not feel that it was appropriate for them to make more money in Los Alamos than students made who interned on the UCSB campus.

One student’s foreign-national paperwork took a long time to process because the student was from a country that is on the Department of Energy’s “sensitive country” list. Visitors from such countries take longer to process because of the stricter rules imposed after the September 11, 2001, terrorist attacks. Should such a RISE student be selected to work in Los Alamos in the future, emphasis will be placed on closely tracking the paperwork through the Laboratory system.

Because of internal communication problems, the interns were not included in the regular orientation for students. This problem will be corrected in FY04. At least one brown bag luncheon with the interns and mentors is planned in FY04 as a means of orienting the RISE students to the Laboratory. The students also will be encouraged to participate in more Los Alamos organized social events, seminars, and presentations in summer 2004.

The interns were pleased with the housing arrangements in Los Alamos, especially since housing in Los Alamos was cheaper than at UCSB. Housing was arranged through the Laboratory Housing Office.

Overall, the students appeared to enjoy their lab experiences, and they developed good relationships with their mentors.



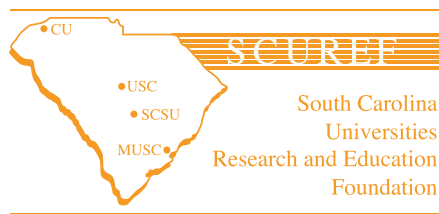
Tristan Rocheleau, who had a RISE internship in FY03, prepared this poster presentation on his work for the Laboratory’s annual student symposium. Rocheleau said his work involved “mostly simulations of metabolic reactions and replication dynamics.” He found it “really interesting.”

South Carolina Universities Research and Education Foundation

Program Description. The South Carolina Universities Research and Education Foundation (SCUREF), incorporated in 1998, is a consortium composed of the four major research institutions in South Carolina: Clemson University, the Medical University of South Carolina, South Carolina State University, and the University of South Carolina.

The primary goal of SCUREF is to enhance educational programs and research opportunities of the participating universities. The consortium utilizes the universities to manage its research and education programs. One of its programs is the Department of Energy Nuclear Engineering and Health Physics Fellowship/Scholarship (NE/HP) graduate program. The program is managed through the Medical University of South Carolina Office of Special Programs. Los Alamos National Laboratory (LANL, the Laboratory) is one of nine participating centers for the NE/HP program. Fiscal year 2003 (FY03) was the fifth year that the Laboratory participated in the program.

(For more information on SCUREF, visit <http://hubcap.clemson.edu/SCUREF/>.)



Performance. Through its participation in the NE/HP program, the Laboratory supports its mission while focusing on the development of a future workforce in the critical skills of nuclear design and evaluation, physics, and hazard-ranked facility operations and security.

Highlights of This Year's Accomplishments. Three NE/HP SCUREF fellows were recruited to the Laboratory in FY03. Each spent a continuous 12-week period conducting research. These students and their work are described in the following paragraphs:

Travis Grove is a graduate student studying nuclear engineering at the University of Illinois at Urbana-Champaign. The summer of 2003 was his second as a student working at Technical Area 18 at the Laboratory. His project in the summer of 2003 involved work with the Monte Carlo Neutron and Photon (MCNP) transport code. He spent considerable time "comparing different cross-section libraries." His work was similar to what he had done in the summer of 2002, he said, but this year, he had a clearance, and that fact made it possible to do more. Grove's mentor was Peter Jaegers of the Advanced Nuclear Technology Group.

Tessa Rivere is a graduate student studying nuclear engineering at the University of Missouri-Columbia. She performed her research at the Laboratory starting in January 2003. Her project involved conducting experiments to determine the distribution of plutonium and uranium among the solid, aqueous, and biological (organic) phases of ternary system (microorganisms, growth medium, and iron oxides). Her mentor was Larry Hersman of the Biosciences Division.

Hilary Teslow is a doctoral candidate in nuclear engineering and radiological sciences at the University of Michigan in Ann Arbor. She began her practicum at the Laboratory in August 2003 and expected to stay at the Laboratory while she conducted her thesis work. She will carry out her research as a member of the Plasma Physics Group's Applied Plasma Technologies Team. She will perform modeling calculations on the interaction of atmospheric-pressure plasma-generated species on the etching of metals (e.g., tantalum and tungsten). Her mentor is Louis Rosocha.



Travis Grove, shown here in his office at TA-18, spent his second summer as a SCUREF fellow at Los Alamos National Laboratory in FY03, working with the Monte Carlo Neutron and Photon transport code. He said he enjoyed being at the Laboratory because "you get to see real work." "It's a lot of fun," he added.

